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III. Solution by G. B. M. ZEER, A. M., Ph. D., Professor of Mathematics and Science, Chester High School, Chester, Pa.; B. F. SINE, Principal Capon Bridge Normal School; Capon Bridge, W. Va.; J. D. CRAIG, Frankfort, N. J.; and MARTIN SPINX, Wilmington, O.

Since the two hands had precisely changed positions, they together had passed over all the spaces on the dial-face ; but, as the minute-hand always goes through 60 spaces while the hour-hand goes through 5, both go through 65.

$$\therefore 65:5=60:4\frac{8}{13}.$$

$\therefore 4\frac{8}{13}$ spaces is the number of spaces passed over by the hour-hand. This is also the distance the minute-hand was in advance of the hour-hand in the first position.

Since the time he left at noon was after 12 o'clock and since the minute-hand always gains 55 minutes in 60 minutes, to gain $4\frac{8}{13}$ minutes we have $55:60=4\frac{8}{13}:5\frac{5}{13}$.

\therefore The time was $5\frac{5}{13}$ minutes after 12 o'clock. In the second position, the hour-hand was $4\frac{8}{13}$ minutes in advance of the minute-hand. $5\frac{5}{13}-4\frac{8}{13}=1\frac{6}{13}$ minutes.

\therefore The time was $1\frac{6}{13}$ minutes after 1 o'clock.

\therefore He left at 5 minutes $2\frac{14}{13}$ seconds after 12 o'clock, and returned at $25\frac{35}{13}$ seconds after 1 o'clock.

Also solved by W. F. BRADBURY, J. W. YOUNG, WALTER H. DRANE, ELMER SCHUYLER, and ALOIS F. KOVARIK

ALGEBRA.

89. Proposed by G. A. MILLER, Ph. D., Instructor in Mathematics, Cornell University, Ithica, N. Y.

Solve by quadratics, $x^2 + y = 7 \dots \dots \dots (1)$,
 $x + y^2 = 11 \dots \dots \dots (2)$.

XI. Solution by W. A. HARSHBARGER, A. M., Professor of Mathematics, Washburn College, Topeka, Kas.

$$y^2 + x = 11 \dots \dots \dots (1), \quad y + x^2 = 7 \dots \dots \dots (2).$$

$$(1)-(2) \quad (y^2 - x^2) - (y - x) = 4 \dots \dots \dots (3).$$

Put $(y+x)=a$, and $(y-x)=b$.

Then by substituting in (3), $ab - b = 4 \dots \dots \dots (4)$.

$$\therefore a^2 b^2 = 16 + 8b + b^2 \dots \dots \dots (5).$$

Subtract, $10ab = 40 + 10b \dots \dots \dots$

$$\therefore a^2 b^2 - 10ab = -24 - 2b + b^2 \dots \dots \dots (6), \text{ and}$$

$$a^2 b^2 - 10ab + 25 = 1 - 2b + b^2 \dots \dots \dots (7).$$

$$\therefore ab - 5 = 1 - b, \quad ab + b = 6 \dots \dots \dots (8). \quad (4) + (8), \quad ab = 5; \quad (4) - (8), \quad b = 1.$$

$$\therefore a = 5. \quad \therefore y + x = 5, \text{ and } y - x = 1. \quad \therefore x = 2, \text{ and } y = 3.$$

[Note. Professor Harshbarger says the above solution appeared in one of the scientific journals a few years ago, but he has forgotten the name of the author.]